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GRIFFIN BONES: ANCIENT FOLKLORE AND PALEONTOLOGY

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ABSTRACT: The griffin or *gryps* was first described ca. 675 B.C. in a Greek work about Central Asia. The *gryps* was a lion-like quadruped with an eagle-like beak; it made nests on the ground and was associated with gold-mining and steppe nomads. Since the 17th century, the griffin has been interpreted as an imaginary symbol of, for example, vigilance; as a garbled description of a real but unfamiliar living creature, such as the lammergeier (bearded vulture); or as an archetypal memory of extinct prehistoric animals. A cross-disciplinary approach, drawing on Greek and Roman literature and art (700 B.C. to A.D. 300), and on modern archaeological, paleontological, and geological evidence, suggests that griffin folklore arose from ancient observations of rich dinosaur fossil beds near Central Asian gold deposits. Fossil remains—including nests and eggs—of the Late Cretaceous *Protoceratops* and other beaked dinosaurs match many of the classical griffin's attributes. Ancient caravan routes passed through the Altai-Tien Shan basins, where such fossils are continually exposed by erosion, and where alluvial gold-sand has been mined since the Bronze Age.

INTRODUCTION

Beginning in the 7th century B.C., the Greeks began to make contact with the nomadic cultures of Central Asia. Along with gold and exotic goods from the East came folktales about remote lands and their inhabitants. The first written description of the griffin, or *gryps,* appeared in Greece during this period. The griffin, already known in Near Eastern art, was said to have four legs and a strong beak. It was associated with gold-mining and nomads, and later was said to lay eggs in burrows in the ground.

In 1646, Sir Thomas Browne wrote a treatise called *Pseudodoxia Epidemica* (Vulgar Errors), in which he declared that the ancient griffin was merely a symbol, an imaginary composite created to combine the noble attributes of the eagle and the lion. In 1652, however, Andrew Ross disagreed with Browne, arguing that the *gryps* may have been an attempt to describe an unusual animal of Scythia or Cathay. According to Ross, Browne "misrepresented" the ancient writers; they had never claimed that the griffin was a crude conjunction of two animals, "a lion behind and eagle in the forepart." Instead, they said only that the four-legged creature had a beak. Ross pointed out that bats, flying fish, giraffes, marsupials, and dog-headed apes had once sounded like "mixt and dubious" fantasies, yet they later turned out to be real animals (Nigg 1982: 87–94 and refs.). But Ross's voice was drowned out in the "scientific" effort to discredit old travelers' tales. For more than three centuries, then, most scientists, classicists, and art historians have

accepted Browne's declaration that the classical griffin was purely imaginary and symbolic.

Ross's optimism was not rewarded—no living mammal with four legs and a hooked beak was ever found. But he was right to challenge Browne's reading of the ancient sources, which do not portray the griffin as a hybrid like the Centaur, Sphinx, or Minotaur. When we unbraid the strands of this Central Asian folklore, sorting out elements accumulated over a millennium of Greek and Roman retellings, paying attention to geography and chronology, and drawing on the disciplines of geology, archaeology, and paleontology, I believe that a good case can be made for a legend based on a real animal (Mayor and Heaney, in press).

The first and only attempt to explain the griffin legend in terms of prehistoric remains came in 1827, when Adolph Erman, a geologist with an interest in classics, traveled across south Russia and Siberia. He learned that Ice Age woolly mammoth bones, found in great abundance along river banks, were identified by the natives as the remains of colossal bird-monsters killed by their ancestors. Erman suggested that discoveries of such bones in antiquity might have been "the prototype of the Greek story of the Grifons." He remarked that gold-sand lay just beneath the peat that contained the mammoth remains, which seemed to account for the association of griffins and gold (Erman 1848: vol. 2: 87–89, 377–82, Bolton 1962: 84, Costello 1979: 76, Mayor and Heaney, in press, note 2).

Erman's remarks fell into obscurity until 1962, when the classicist J. D. P. Bolton wrote a book about Aristeas, the 7th century B.C. Greek traveler who first described the *gryps* of Central Asia. Bolton called Erman's theory "attractive" and "impressive," but rejected it because the griffin tale originated near the Altai Mountains, far from Erman's mammoth remains north of the Urals (Bolton 1962: 84, 93, 101, 176, Phillips 1955: 161–77). Once again, the idea that the legend might contain a kernel of zoological truth was set aside. Yet a close reading of the ancient sources (as Ross advocated in 1652), along with neglected archaeological, geological, and paleontological evidence, allows us to revise Erman's tentative fossil theory and to satisfy Bolton's geographic objections.

ANCIENT SOURCES, GEOGRAPHY, CHRONOLOGY

Griffin-type animals combining the features of birds and mammals appeared in Near Eastern art as early as 3000 B.C., and they show up in Mycenaean (Bronze Age Greek) art as well. However, we have no way of knowing what kind of folklore, if any, was attached to these creatures. The first *written* description of the griffin that we know of appeared in Greece during the 7th century B.C., when the Greeks began to make contact with the nomadic cultures of Central Asia. Little new information about the *gryps* seems to have been added after the 3rd century A.D. After that, the tradition

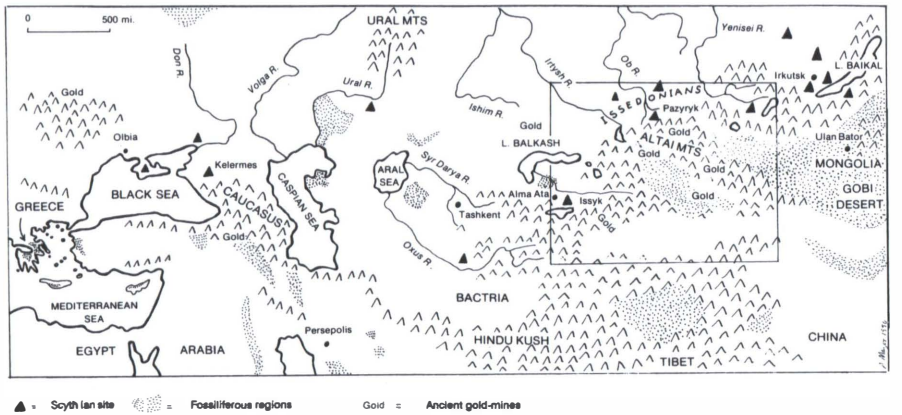

FIG. 1. Locations of Scythian sites, fossiliferous regions, and gold deposits mined in antiquity. (Adrienne Mayor.)

crystallized into what was to become the fabulous medieval griffin with its Christian symbolism. The griffin was popular in Greek and Roman art between about 700 B.C. and A.D. 300, and some of those representations appear to be related to the folk themes preserved in the coeval literature. This thousand-year period of linked, consistent, and thriving written testimonies and related art can be seen as the "natural lifespan" of the Greco-Roman version of griffin lore (Nigg 1982: 53–79, Bartscht 1987, Bliss 1987, Bisi 1965).

The word "griffin" comes from the Greek *gryps* meaning "hooked," as of a claw or beak, and may be related to the Persian *giriften,* "to grip" or "seize" (Liddell and Scott 1940: s.v. *gryps,* Costello 1979: 78). The word was apparently first used by Aristeas, a Greek from the Black Sea area, in his lost epic, the *Arimaspea,* written in about 675 B.C.—around the time of the earliest Greek contacts with Scythian nomads east of the Caucasus. According to the surviving fragments of his work (preserved in works by later authors), Aristeas said that he traveled among the Scythians, going as far as the land of the Issedonians (the easternmost Scythian tribe), where he heard about griffins and Arimaspeans. Issedonian territory formed a wedge, bounded by the Tien Shan and the Altai mountain ranges. Ptolemy, the 2nd-century A.D. geographer, and ancient Chinese sources locate the Issedonians along the old trade routes from China to the West, from the western edge of the Gobi desert to the Dzungarian Gate (Figs. 1 and 2) (Mayor and Heaney, in press; notes 5, 7, 41, Bolton 1962: chap. 4 and 5, Phillips 1955: 161–77, Minns 1913: 104ff, Smith 1856: s.v. *Issedones,* Charriére 1979: 266–67, Hudson 1931: 32–50 and chap. 2 with refs.).

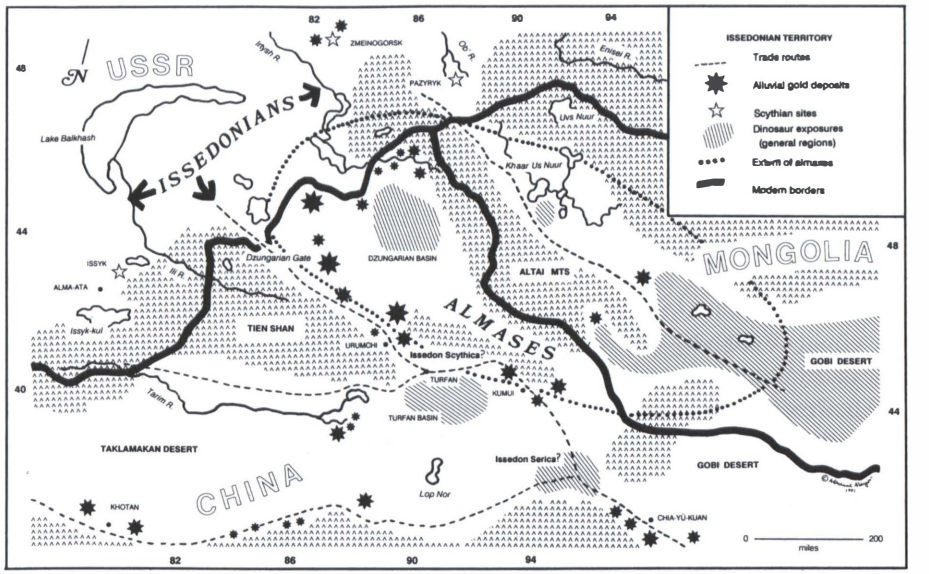

FIG. 2. "Griffin Territory": ancient trade routes; Scythian sites; locales of dinosaur fossil exposures, including *Protoceratops* skeletons, eggs, and young; extent of Almas folklore; and alluvial gold deposits. (Adrienne Mayor, based on information from Dale Russell, Boulnois 1983, Cable 1987, Hudson 1931, Thubron 1989, Weishampel, Dodson, and Omólska 1990, and Dong 1988.)

Modern archaeology confirms that Scythian nomads, as described by ancient Greek sources, flourished in this area during the time of Aristeas up to about A.D. 300, and that trade was ongoing between Scythians and the West (Mayor and Heaney, in press, Davis-Kimball 1991, Basilov 1989, Mongait 1961: 76, 170, Artamonov 1969, Metropolitan Museum of Art 1975, Rolle 1989). A recent linguistic analysis of the Scythian word *arimaspu* (recorded by Herodotus in his discussion of griffins and Arimaspeans) shows that the Arimaspeans can be identified with *almases,* elusive, shaggy, monocular creatures of Mongolian folklore (Mayor and Heaney, in press).

The first surviving ancient work to use Aristeas's *Arimaspea* was written by the Greek playwright Aeschylus, in about 460 B.C. Aeschylus relied on Aristeas for natural details about Central Asia in his tragedy *Prometheus Bound,* set far beyond the Caucasus (Bolton 1962: 45–64, Griffith 1983: 230, 266, Phillips 1955: 163). Lines 790–805 of the play describe a remote, dangerous land reached by caravan routes to the Far East, a land inhabited by nomadic horsemen who prospected for gold. The route crossed desolate plains, the home of fearsome gorgons who turned living things to stone, one-eyed beings called Arimaspeans, and finally, the *gryps* or griffin. Aeschylus

calls these animals "silent hounds with sharp beaks" (lines 803–4). The *gryps* is *not* an eagle, as many have claimed, since Aeschylus was careful to distinguish the *gryps,* which had a beak but no wings, from the winged eagle, *aetos* (line 1,022; and see Liddell and Scott 1940: s.v. *aetos*).

In Aeschylus's play, the god Hermes tells Prometheus that cosmic thunder and lightning and torrential rain will pound the mountain cliff where Prometheus is chained. An avalanche will bury him at the bottom of the ravine, and he will be "held fast by arms of stone" for eons. "You will travel through vast tracks of time, and at last come back into sunlight," a carcass for eagles to ravage (lines 1,015–25; see also Griffith 1983: 266). Using Aristeas's work, Aeschylus evoked a primeval wasteland with bizarre creatures and bodies trapped in stone for eons, a place where nomads seek gold.

The historian Herodotus was a contemporary of Aeschylus. In about 450 B.C., the well-read Herodotus traveled to Egypt, Asia Minor, and Scythia "expressly to seek information" (2.44). He asked people for explanations of unusual stories, and tried to find supporting evidence. He visited the Scythians just beyond the Black Sea, and he quoted Aristeas about lands farther east: "Aristeas says in his work that he went as far as the [land of the] Issedonians. . . . Beyond were the gold-guarding griffins" (4.13). Herodotus points out that the information about "gold-guarding griffins" and "Arimaspeans" who dwell in lands beyond the Issedonians came to the Greeks second-hand, based on what Scythians heard from Issedonians (4.25, 4.27). Of the rich gold deposits of Asia, Herodotus states: "I cannot say for sure how the gold is obtained: some say that one-eyed men called Arimaspeans steal it from griffins. But this I hold incredible (that a race of men would be born with only one eye)" (3.116). Note that while Herodotus rejects the existence of cyclopean *men,* he does not doubt the existence of the *gryps* animal.

The next item of griffin lore comes from a fragment of Ctesias, a Greek physician who lived in Persepolis around 400 B.C. (Bigwood 1989). Ctesias said that Asian gold was hard to obtain because it was "in high mountains inhabited by griffins, a race of four-footed birds, almost as large as wolves and with legs and claws like lions" (Costello 1979: 76, Photius *Bibl.* 72.46b.30).

Pliny the Elder's *Natural History* of A.D. 77 marks the next important point in the tradition. Besides noting the griffin's "terrible hooked beak" (10.70.136), Pliny was the first to mention its long ears (10.70.136) and wings (7.1.10), two features prominent in griffin art. Pliny also referred to "many authorities" besides Aristeas and Herodotus who wrote about the griffins of the gold-mining regions of far Scythia. He summarized: "Arimaspeans are . . . always fighting for gold with the griffins, winged animals whose appearance is well-known. *The griffins toss up gold when they make their burrows*" (7.2.10, my emphasis; see Bolton 1962: 64–65). This last sentence is the first mention of griffin nests.

About a hundred years after Pliny, a scholar named Philostratus wrote a biography of Apollonius of Tyana, a philosopher who was said to have traveled extensively in Asia and India during the end of the 1st century A.D. According to his biographer, Apollonius reported that the rocks in the region of the griffins are "flecked with drops of gold like sparks," which the griffins are able to quarry because of their strong beaks. The griffins "resemble lions in size and strength." As for wings, he claimed that griffins "are not winged as are real birds" but have "webbed membranes" which allow them to make short "hops" in the air during combat (Philostratus *Vita Apollonii* 3.48).

In about A.D. 170, a very knowledgeable Roman named Pausanias traveled throughout the Greek world. Pausanias (1.24.5–7) quoted Aristeas as stating that "griffins fight for gold with the Arimaspeans beyond the Issedonians. . . . Griffins are like lions but with the beak and wings of an eagle" (8.2.7). Pausanias criticized those who believed that griffins are spotted, "Those who love to hear marvelous stories cannot resist adding details, thus ruining the truth by mixing in lies" (8.2.7). He also remarked that in the land of griffins, gold "emerges near or *on the surface* of the earth," which recalls Pliny's comment that griffins scrabble up gold when digging burrows (my emphasis, 1.24.6; see Bolton 1962: 65).

Within a generation after Pausanias, the bare bones of the simple report began to be fleshed out with more vivid details. Here is the version of Aelian, a Roman compiler of natural history in about A.D. 200: "I hear that the griffin has four legs like a lion, with talons as strong as can be. . . . It is winged and the plumage on the back is reputed to be black, with red chest and white wings." Aelian then quotes Ctesias, who stated that "the neck has dark-blue feathers, it has the beak of an eagle, and a head just like artists and sculptors portray." Aelian continues: "Its eyes are fiery. It makes its nest in the mountains, and although it is impossible to take a full-growth griffin, people sometimes capture the chicks. The Bactrians say that griffins guard the gold of those parts, which they dig up and weave into their nests. . . . However, the Indians sensibly deny that the creatures intentionally guard the gold. The truth is that when the prospectors approach, the griffins take fright for their young, and so give battle to the intruders. They never fight lions or elephants, but they can easily overcome any other animal."

Aelian tells how the miners travel, in "armed groups of one or two thousand," to the wilderness of the gold deposits. "Out of respect for the bravery of these animals, they avoid hunting for gold in the day. They approach in the night when they have the most chance of avoiding discovery. Now, the place where the griffins live and the gold is found is a howling desert. The treasure-seekers, waiting for some moonless night, come with shovels and sacks and dig. If the griffins do not notice them, the men reap a double reward, for their lives are preserved and they bring home their cargo of gold . . . rich profit for the dangers they face. But if they are caught in the act it

is all over for them. . . . I am informed that the miners return home after two or three years" (4.27; see Bolton 1962: 65–72).

A thousand years after Aristeas, Aelian's account retains the basic creature: four legs, claws, and a beak, and associated with gold-mining. Aelian's version incorporates later details and adds embellishments. He gives the griffins a more natural motive for aggressive behavior: they defend nestlings, not gold. And Aelian quotes a traveler (Ctesias) who affirmed that the animal was as artists had portrayed it (see Mayor and Heaney, in press: notes 8–14).

Griffins in Art

Scythian art (700 B.C.–A.D. 300) is notable for its depictions of many unknown animals, including griffin-types (Bisi 1965, Bouras 1983, Flagge 1975, Bartscht 1987, Metropolitan Museum of Art 1975, Rudenko 1970, Bolton 1962, Rolle 1980). Scythian tombs of the time of Aeschylus and Herodotus have been excavated at Pazyryk, Issyk, and other sites near the ancient gold-mining areas of the old Issedonian territory; they have yielded hundreds of gold artifacts featuring beaked quadrupeds (Rudenko 1970, Mongait 1961, Artamonov 1969, Rolle 1989, Basilov 1989, Piotrovsky 1987, Davis-Kimball 1991). One quite remarkable discovery was the mummified body of a Scythian chief, whose skin was tattooed with griffins and other known and unknown animals (Fig. 3) (Rudenko 1970: 109–14, 260–66, Rolle 1989: 83–85).

A mirror from the Scythian site of Kelermes, east of the Black Sea, shows a griffin fighting two shaggy creatures, tentatively identified by scholars as Arimaspeans. The mirror was made in about 570 B.C. (Bolton 1962: 5–7, 89–91, Metropolitan Museum of Art 1975: plate 4, Artamonov 1969: plates 29, 33).

In the 600's B.C.—around the time of Aristeas and the first Greek contacts with Scythians—the griffin became a popular theme in Greek art. Bronze griffins in the Archaeological Museum of Olympia and the island of Samos offer typical examples (Figs. 4, 5, and 6). The earliest bronzes show naturalistic, almost reptilian creatures with open beaks, large eyes, forehead knobs, upright "ears," and scaly or crested necks. Wings were usually small and stiff, and the *gryps* was clearly earthbound. Later, the "ears" and knobs became decorative, and the neck was elongated; the wings were realistically feathered and curved (see Bolton 1962: 88–89), but the griffin was still flightless. A few exceptions have a religious context: for example, some artistic depictions show griffins drawing Apollos' chariot (Flagge 1975: 73–75, 125), or carrying a goddess aloft (Strabo 8.3.12).

A portrait of a mother griffin protecting a baby griffin can be seen in the Archaeological Museum at Olympia, Greece, on a bronze relief made in about 630 B.C. (Fig. 7) (Andronicos 1975: 16, plate 48). This early item brings to mind Aelian's later claim that griffins protected their young.

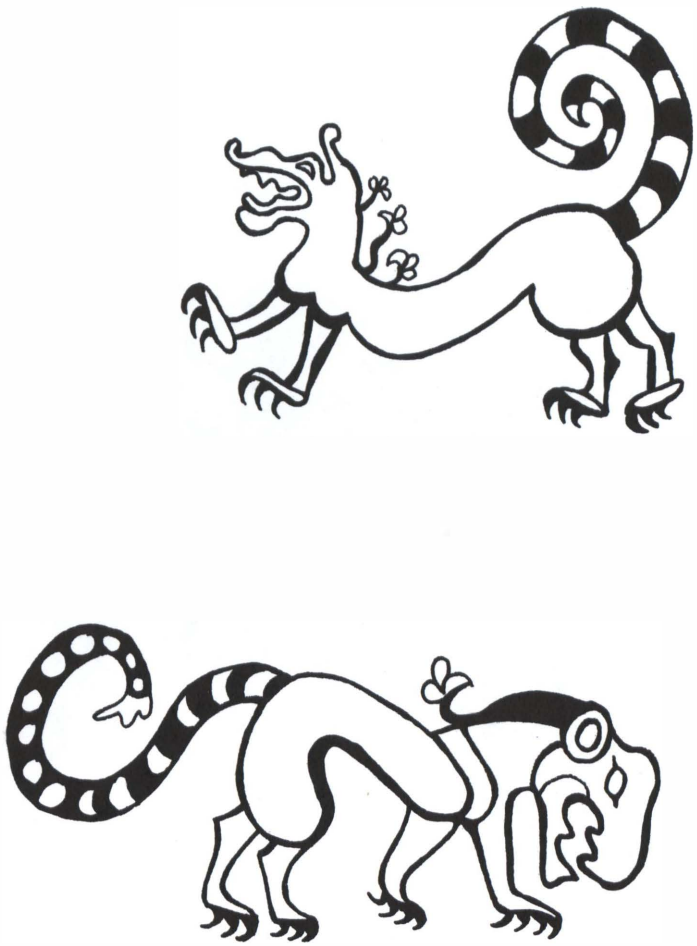

Fig. 3. Tattoos of two unknown animals from a mummified body in a Scythian tomb of mid-400's B.C., excavated by Rudenko at Pazyryk. (Adrienne Mayor, after Rudenko 1970.)

Two Greek vase paintings from the 300's B.C. show nomads on horseback battling griffins (Fig. 8). Bolton points out that "nuggets of gold" are included in the scenes, which appear to be set in a "rough" and "blasted" terrain (Bolton 1962: 37 with refs.).

In about A.D. 300, about a hundred years after Aelian wrote about Asian gold-miners and griffins, the owner of a villa in Sicily commissioned a mosaic. The "Great Hunt" mosaic, located near Piazza Armerina, is a panorama of lions, tigers, elephants, camels, ostriches, and other exotic but real

FIG. 4. Bronze griffin, Olympia, mid-600's B.C. (time of Aristeas).

animals from the far fringes of the Roman Empire. The beasts are all being captured by various methods. At the very end of the panel is a griffin, lured to a trap baited with a man (Toynbee 1982: 27–29, and Fig. 1).

These are only a few examples of thousands of griffins in Scythian, Greek, and Roman art between 700 B.C. and A.D. 300. Combining features described in the art and the literature of this period, we can draw a composite of the griffin's appearance, habitat, and behavior. The *gryps* was a four-legged animal about the size of a lion, with a tail and strong claws, but it had a powerful beak like that of a bird of prey. Despite their wings, griffins did not fly. They had large eyes, and many had upright "ears" or horns, and a forehead knob. There was often a ruff or crest on or around a leathery, plated, scaled, or feathered neck. The griffin made its nest on the ground; it fiercely protected its young. Its territory was the desolate wilderness near the gold deposits of the Altai and Tien Shan mountains and valleys. Griffins

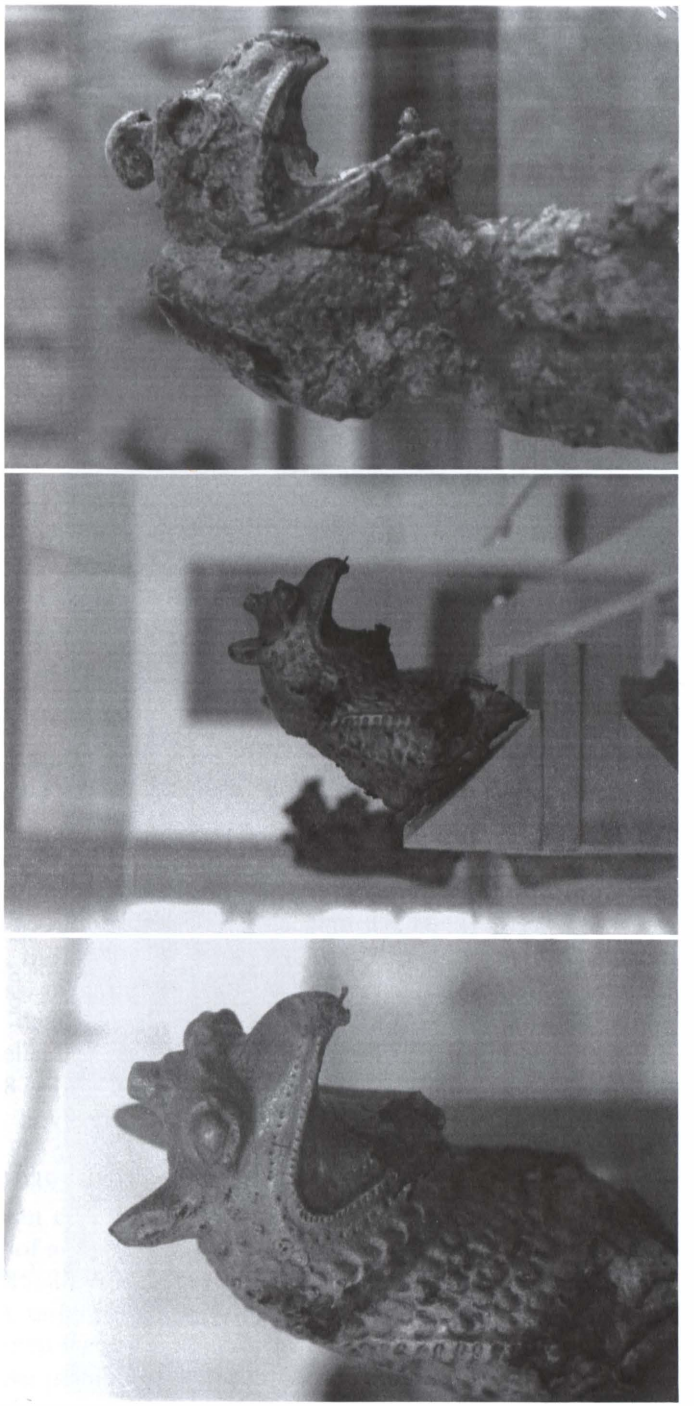

FIG. 5. Bronze griffins, Samos, 700–600 B.C. (time of Aristeas). Left and center photos show views of same head. (Adrienne Mayor.)

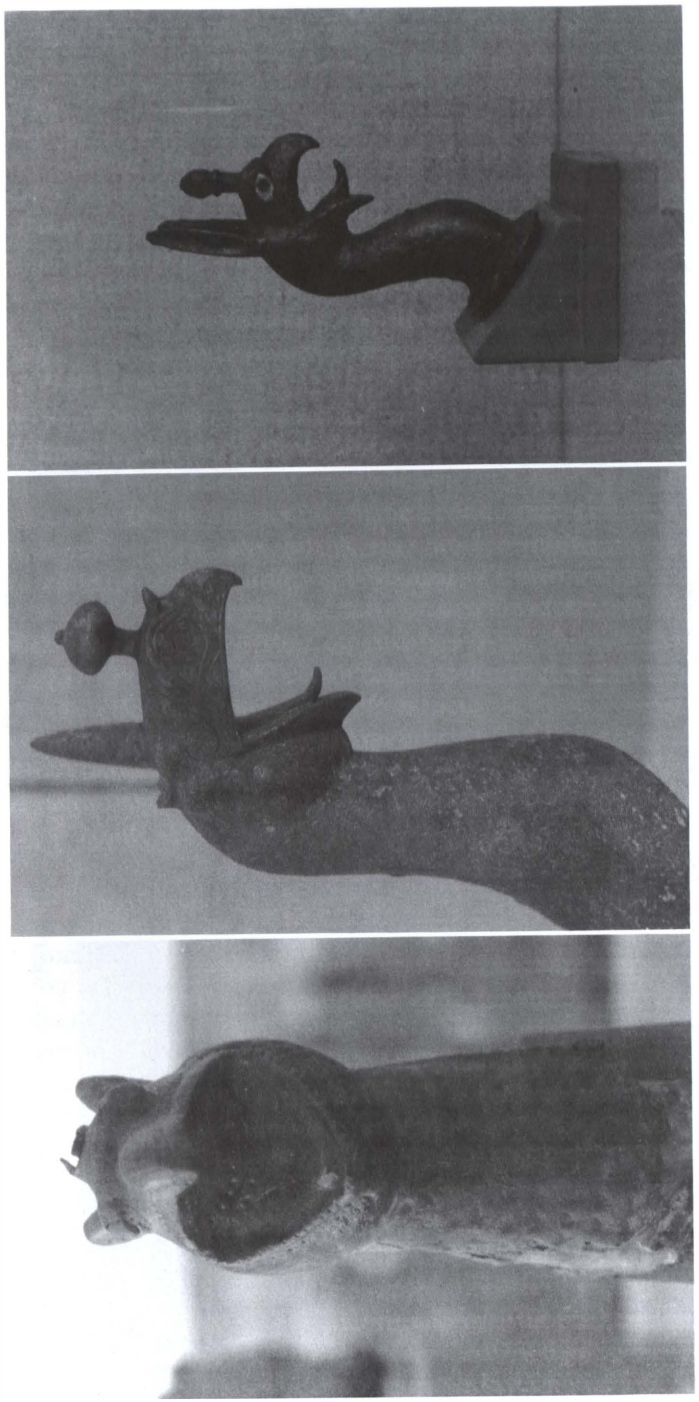

FIG. 6. Bronze griffins, Samos, 700–600 B.C. (Adrienne Mayor.)

FIG. 7. Bronze mother and baby griffin, Olympia, mid-60's B.C. (After Bouras 1983.)

were associated with nomadic horsemen, one-eyed beings, and creatures somehow turned to stone.

PREVIOUS IDENTIFICATIONS OF THE GRIFFIN

Many hypotheses have been proposed for the origin of the griffin since Ross and Erman attempted to account for the legend's zoological features. As already noted, art historians and classicists usually consider the griffin to be an imaginary composite of real animals. Their main interest is in tracing how the image spread from Asia to the Mediterranean (Charriére 1979, Piotrovsky 1987: 17–18, Phillips 1955: 172). Since Browne's 1646 treatise, the griffin has been interpreted as a symbol representing vigilance, swiftness, the sun, the sky, guardianship, generosity, Apollo, Zeus, royalty, loyalty, death, and even the difficulty of mining gold (Bartscht 1975, How and Wells 1928: Vol. 1: 307, Nigg 1982: 14–18). Art historian Charriére (1979: 87–95) speculated that the "delirium of [animal] forms" in Scythian art may have arisen from hallucinations induced by hashish, which Herodotus (4.73) says, and modern excavations prove, was used by Altai nomads (Rolle 1989: 93–94, Rudenko 1970: 197, 199, 284–85).

Bartscht calls the belief in griffins an antidote to "the intellectual desiccation" of an overly rational society, or a "mirror of our own dual nature" (1987: 85–86, 99). Others identify the griffin as a garbled description of a real but unfamiliar living animal. For example, ancient historian Minns maintained that the little *baibak* (steppe jerboa) or the *suslik* (steppe squirrel) may have inspired the legend because of their "watchfulness" and habit of

FIG. 8. Vase painting of 300's B.C., from Caria, Turkey, showing nomad on horseback fighting griffin in "wilderness" landscape; gold nugget above griffin. (Adrienne Mayor, after F. Winter, in *Mitteilungen des deutschen archaologischen Instituts. Athenische Abteilung,* 1887, plate 11.)

burrowing in gold-sand (Minns 1913: 6, 113, Bolton 1962: 84, cf. Cable 1987: 97). And Valentine Ball concluded in 1884 that the *gryps* was a "tolerably accurate description" of a large dog, the ferocious mastiff of Tibet (Costello 1979: 78, cf. Cable 1987: 29; for photograph see Andrews 1926: xix).

Some have suggested that the griffin arose from vague collective memories of flying reptiles or other long-extinct prehistoric species, an idea proposed in the 1920's by German paleontologist E. Dacqué (Carrington 1957: 76, Ley 1948: 51, Lum 1952: 24). But as Costello (1979: 81) points out, this "romantic and unscientific" notion assumes that humans coexisted with relict dinosaurs. As for Erman's mammoth bone theory, Costello follows the classicist Bolton in rejecting the idea: The mammoth "bones . . . found . . . on the banks of Siberian rivers" are "a long way from the Altai Mountains and the [nomads] that Aristeas was describing" (Costello 1979: 76).

Costello (1979: 80–81) believes that the griffin must have been based on a "common feature of [the nomads'] lives." His candidate is the Central Asian lammergeier, a bearded vulture with a ten-foot (3 m) wingspan. Others have claimed that the griffin was really an eagle or other raptor (Bartscht 1987: 91, 96, cf. Jennison 1937: 115, Griffith 1983: 231). However, as we have seen, Aeschylus, the first surviving author to describe the *gryps,* clearly distinguished it from a bird of prey (*Prometheus Bound,* lines 803–4, 1,022).

Furthermore, the Scythians, Greeks, and Romans all portrayed raptors realistically in their art, and Greek and Roman texts described these birds accurately (Pollard 1977: 76–86, 186–87, with ancient refs. and plates 3, 22, 23, 25, Artamonov 1969: plate 118, Piotrovsky 1987: plates 70, 100). It is known that eagles were trained to hunt by steppe nomads since antiquity (Basilov 1989: 149–51). It is unlikely that such familiar birds of prey would generate an image of a flightless quadruped. As Ross noted in 1652, it is the combination of the eagle-like beak with four legs that is so striking.

But Costello's insight, that the griffin must have been based on a real aspect of the nomads' lives is significant, especially when we compare the griffin to imaginary animals of Greek myth. The *gryps* is not a simple hybrid or obvious composite like the half-human, half-animal Centaur, Minotaur, and Sphinx or like Pegasus, the flying horse. In fact, the griffin plays no role in any surviving Greek myth. And unlike the other mythical monsters which are usually singular creatures with a divine genealogy and a name, griffins are generic creatures of a specific region. They do not interact with mythical heroes (Phillips 1955: 172), but are said to be encountered by real people in a distant land rich in gold. The accounts are based on hearsay: no writer claims to have actually seen a live griffin (Bartscht 1987: 90).

Contrary to what might be expected, the fragments of Aristeas's original report quoted by other authors lack sensational folkloric details. In fact, the dissimilarities between the *gryps* and Greek monsters, the consistency of the image and written narratives over centuries, and the natural details about location, nests, and gold added by later writers and travelers all suggest that the griffin legend was based on something observed and verified over time by various people in a specific landscape.

Those who study the griffin legend have tended to conflate anachronistic, fabulous medieval embellishments with the original 7th-century account of Aristeas, which remained relatively unembellished up to the time of Aelian. As we saw, the idea that fossils played a part in the legend has been rejected (Bolton 1962: 84, Carrington 1957: 76–77, Lum 1952: 48–50, Costello 1979: 76). Yet no griffin scholar seems to have considered paleontological evidence in the region where Aristeas learned about griffins from the Issedonians. Indeed, the importance and frequency of fossil discoveries in antiquity has been underestimated (Phillips 1964, Ley 1968: 191–92, Mayor 1989, Mayor and Heaney, in press: notes 25–30). Historical examples of artistic reconstructions of fossils and folklore based on prehistoric remains can serve as models in tracing the griffin legend.

FOSSIL DISCOVERIES IN ANTIQUITY

Numerous Greek and Roman texts refer to the discovery of fossil remains (Bromhead 1945, Mayor, in preparation). Some fossils were exposed by earthquakes and erosion; others were deliberately dug up. The Greeks and

Romans regarded large unfamiliar bones as either the remains of mythical heroes, monsters, and giants, *or* skeletons of extinct animals or men of the remote past (Halliday 1975: 208–11, Buffetaut 1987: chap. 1). Theories of evolution and extinction were developed in the 6th century B.C. by Anaximander and Xenophanes, who had observed marine fossils embedded in rock (Lloyd 1976: vol. 2: 36–37 and refs., Osborn 1929: 39–102, Phillips 1964). In the mid-400's B.C., Empedocles speculated about evolution based on the bones of prehistoric elephants, a common fossil in the Mediterranean (Matthews 1962: 144–45, Wendt 1968, Reese 1976).

Herodotus apparently recognized fossils as traces of extinct life-forms (Lloyd 1976, vol. 2: 36–37, 66–67, Carrington 1958: 48). For example, when he investigated the folklore of winged serpents in Arabia, he says he was shown "countless bones and backbones of serpents, many heaps of vertebrae, great and small" in the walls of a narrow mountain pass (2.75)—in an area that is fossiliferous. Elsewhere, Herodotus relates that a man digging a well at Tegea (Peloponnese) found a huge skeleton (1.67–69; see also 9.83).

Plato, Aristotle, and Theophrastus discussed extinction and changes in landforms based on observations of fossils (Plato *Critias* 110d–111e, Phillips 1964 with refs., cf. Ovid *Metamorphoses* 1 and 2). The Epicurian philosopher Lucretius (ca. 60 B.C.) wrote about the inviability of "composite monsters" and about the evolution and extinction of ancient animals (2.700–729, 4.722–76, 5.772–924). According to the Roman historian Suetonius, the Emperor Augustus built a museum for the "monstrous bones of extinct sea and land creatures," which some people called "giants' bones" (*Augustus* 72.3). The Greek biographer Plutarch (ca. A.D. 80) told of big bones exposed on the island of Skyros in about 475 B.C.; they were shipped to Athens for display (*Theseus* 36 and *Cimon* 8). Plutarch also discussed the colossal bones commonly seen on Samos, an island rich in fossils. In antiquity, some believed that Samian fossils were the remains of ancient monsters called Neïdes; others said they were elephants who died in long-ago earthquakes (Plutarch *Greek Questions* 56, Halliday 1975: 207–9; for paleontology of Samos: Solounias 1981, Brown 1927, Mayor 1989: 21).

Pliny the Elder gives the exact dimensions of huge skeletons discovered throughout the Roman Empire (e.g., a 69-foot [21-m] skeleton revealed by an earthquake in Crete, 7.16.73–75; bones from a 60-foot [18-m] skeleton used to construct houses in northern India, 9.2.7; a 40-foot [12-m] skeleton, 9.4.10–11). Pausanias describes many instances of the discovery and transport of colossal bones, said to belong to heroes, giants, sea monsters, elephants, or ancient men. Pausanias saw such relics displayed in temples and public buildings, and he tells how a boat carrying fossils was lost at sea (1.17.6, 1.28.7, 1.35.4–6, 2.10.2, 3.3.6, 3.11.10, 4.32.3, 5.12, 5.13.4–6, 8.9.3, 8.29.3–4, 8.32.5, 9.21.4).

Chinese chronicles describe the export of fossils and mammoth tusks to

Rome in A.D. 166 (Hudson 1931: 89–90); other Chinese sources of the 2nd century B.C. and the 3rd century A.D. describe the excavation of "dragon bones" (Oakley 1975: 40, Dong 1988: 9). In northern India, Apollonius of Tyana came across "a great many heads of dragons" enshrined in a holy city (Philostratus *Vita Apollonii* 3.9; see also "giant remains," 5.16). Philostratus lists a dozen instances of gigantic bones exposed by earthquakes, erosion, and ploughing around the eastern Mediterranean; they were carefully measured (*Heroicus* 8.1–14; Jeffrey Rusten, translation forthcoming). Aelian refers to the giant bones of extinct beasts displayed in Samos (17.28), and reports that a monster's bones were discovered after a great fire on the island of Chios: "From these," he says, "people were able to guess how large and how awful the brute was when still alive" (16.39).

These accounts show that, when the ancients encountered fossils, they tried to visualize the creatures in life, and they often deliberately collected and measured unusual remains. Recent archaeology reveals that fossils were stored with other valuables in treasuries, temples, and shrines. Modern evidence also shows that fossil bones, shells, claws, horns, eggs, and teeth of exotic or extinct animals were trade items in antiquity (Buffetaut 1987: chap. 1, Oakley 1965, Reese 1976: 92, 1982, 1984, Boessneck and von den Driesch 1979, 1981, Rapp and Aschenbrenner 1978: 69–70, Rothenberg 1988: 266–68, Kennedy 1976, Hudson 1931: 28–29, 89–90; for maps of trade routes see Cable 1987, Hudson 1931: 37). For example, at Egyptian shrines of the 13th century B.C., excavators found tons of fossil bones and ivory dedicated to the god Set (Oakley 1975: 42–44). A classical shipwreck discovered off Cyprus in the early 1970's may have been carrying a load of fossils (David Reese, personal communication 1989).

Fossils and Folklore

It has long been recognized that legends of dragons, giants, and monsters occur in fossil-rich areas (Thenius 1973: 34–39, Carrington 1957: 71, chap. 7, 1958: 49–54, Ley 1948: 42–54, Wendt 1968, Sutcliffe 1985: chap. 3, Buffetaut 1987, Solounias 1981: 18–19, cf. Cable 1987: 97). The Cyclops legend is perhaps the best-known model of the way fossils can generate both rational speculation and folklore. Empedocles, writing in the 400's B.C., was the first scientist to associate fossil elephant skulls (a common fossil in the Mediterranean) with the Homeric legend of the Cyclops (Reese 1976: 93). Austrian paleontologist Othenio Abel pointed out in 1914 that the elephant's large nasal cavity would naturally lead someone who looked at an elephant skull (but had never seen a live elephant) to visualize a one-eyed giant (Sutcliffe 1985: 27, Thenius 1973: 36–37, Buffetaut 1987: 5).

Another oft-cited example of the interaction of folklore and artistic reconstruction was documented in the late 1500's. In about A.D. 1300, a colossal skull was unearthed by miners near Klagenfurt, Austria (Mayer and

Heaney, in press: note 32). In 1590, sculptor U. Vogelsang made a life-size reconstruction of the head—guessing at the rest of the body—for the town square. A century later, a statue of a standard folklore giant with a club was put up near the "dragon," which was now said to have once ravaged the town. The original skull has since been identified as that of an Ice Age woolly rhinoceros (Thenius 1973: 37–38, Sutcliffe 1985: 30–31).

Paleontology and Geology in Griffin Territory

According to Herodotus, "It was among the Issedonians themselves that the strange tales" of "gold-guarding" griffins originated. To test the fossil theory, we need to locate the important gold deposits exploited by these nomadic peoples, and then determine whether ancient gold-seekers would have been likely to encounter fossil-bearing rock where prehistoric remains could have inspired the image of the *gryps*.

The extreme climate, remote and difficult terrain, long history of border wars, ongoing unrest, Cold War tensions—not to mention myriad name and spelling changes (e.g., Dzungaria, Sungaria, Zungaria, Junggar)—have all contributed to the paucity and obscurity of mineralogical and paleontological information about the Issedonians' old territory, on the border between China and the former U.S.S.R. The Altai and Tien Shan mountain ranges contain extremely abundant gold-sand which constantly erodes from the massifs down into basins below.

Geomorphologist Sheldon Judson clarifies the geological processes: auriferous sand has an igneous origin in the "granites of the high mountains; placer gold in a lighter quartz matrix is continually washed down . . . and deposited in the alluvial basins and gullies below. Besides alluvial deposits of gold nuggets, flakes, and dust, colluvial (gravity on slopes) and even aeolian (wind) transport of gold can occur in the desert" (Judson, personal communication 1991). Modern travelers report that sandstorms in the area can transport pebbles the size of U.S. silver dollars; ancient and modern writers have described the collection of precious minerals exposed after violent winds in this region (Pliny 37.17.65, Cable 1987: 24, 62–63, 79, 83, 201, Mayor and Heaney, in press: note 35).

Spectacular amounts of gold artifacts come from Scythian tombs along the slopes of the Tien Shan and Altai ranges; these mountains and their alluvial basins were the source of Scythian gold. The exact locations and volumes of gold deposits in China and the former U.S.S.R. have traditionally been closely guarded secrets, but place-names (e.g., *altai* means "gold") and the writings of travelers, archaeologists, and even Western intelligence sources indicate that gold-sand is plentiful and has been mined since antiquity in the gullies skirted by the caravan routes. Cable (1987: 23, 28–29) gives other place-names meaning "gold." Russian gold-seekers of the 1800's, guided by old place-names, exploited the detritus of ancient Scythian gold-mines. Between 1860 and 1950, Russian archaeologists discovered more than a hundred ancient Altai gold-mines worked since about 1500 B.C. (see Fig. 2). One mine even contained the skeleton of a Bronze Age miner whose leather bag still held gold (Rolle 1989: 52–53, Phillips 1955: 171, Hudson 1931: 43, Boulnois 1983, Johnston 1850: s.v. *Altai*, Stein 1981: vol. 1: 192–94).

Some of the world's richest fossil beds are located in the sedimentary cliffs and badlands along the old caravan routes across the Gobi, Turfan, and Junggar deserts between the Altai and Tien Shan ranges (see Fig. 2). Some 13th century Chinese travelers mentioned supernatural creatures, "fields of white bones," and "heaps of very hard and bright white stones like bones" in these deserts (Mayor and Heaney, in press: note 39). Ancient gold-seekers may well have been the first to encounter the eroding fossil remains, since archaeology shows that the auriferous sand of this region has been mined since the Bronze Age (cf. Mayor and Heaney, in press: note 32).

Roy Chapman Andrews was the first modern paleontologist to investigate the fossils of the Gobi desert in the 1920's, after he heard local folklore about dragon teeth and bones (Andrews 1926: 192–93, Colbert 1971: 225, cf. Sutcliffe 1985: 30–34). Andrews's Central Asiatic Expedition (sponsored by the American Museum of Natural History) traveled over ancient caravan routes to a blasted landscape where they discovered—on the surface or partially embedded—bones of Late Cretaceous dinosaurs, ranging from newly-hatched babies to adults. Many of the skulls had prominent beaks, knobs, and distinctive head frills, and were preserved in full articulation with four-limbed skeletons.

The windswept region had once been a vast nesting ground of the dinosaur *Protoceratops*. Shallow depressions still held clutches of their fossilized eggs and young. The eerie panorama of throngs of strange animals was awesome to the team. Andrews wrote that the bones were "strewn over the surface almost as thickly as stones" and that the desert was "almost paved with bones." In one afternoon, each team member found a dinosaur skull; in two weeks the group gathered more than a ton of fossils, and in two summers over one hundred *Protoceratops* were excavated (Andrews 1926: 180, 192–93, 222–23, 227–28, Colbert 1971: chap. 8).

Excavations continued sporadically in the deserts. Between 1946 and 1949, Soviet paleontologists collected 120 tons of fossils in the Gobi. In the period 1968–84, Polish-Mongolian teams located more extremely rich dinosaur exposures in the area. In 1987, a Canadian-Mongolian team began work along the Chinese-Mongolian border, also finding numerous complete protoceratopsid fossil skeletons with nests, eggs, and young, and huge isolated claws up to 28 inches (71 cm) long from other species. Since the 1950's, Chinese paleontologists working in the Junggar and Turfan basins have found very rich dinosaur exposures, yielding Psittacosaurs, "parrot-beaked" dinosaurs (Colbert 1971: 250, Kielan-Jaworowska 1968–84, Weishampel, Dod-

son, and Osmólska 1990: chap. 3, Dong 1988, Russell, personal communication 1991, Sutcliffe 1985: 30–34, Norman 1985: 13, 49, 61, 128–33, 150–51, 169, Mayor and Heaney, in press: note 34; also featured in the 1991 NOVA television program *The Hunt for China's Dinosaurs,* WGBH/PBS).

In these windswept dunes, alluvial depressions, and sandstone badlands of the Gobi, Junggar, and Turfan, fossils are constantly being revealed by the same forces of erosion that bring the gold down from the mountains. For excellent photographs of the terrain, see Thubron (1989), Dong (1988), Kielan-Jaworowska (1968–84). Dale Russell, a leading dinosaur theorist and co-leader of the Canadian-Chinese Dinosaur Project, notes that "the extreme aridity and tenuous plant cover" make it possible to see fossils on the surface: the shapes of the skulls and skeletons are "very obvious" and the rock is soft, making collection of partially embedded bones and eggs fairly easy. His colleague, Philip Currie, points out that the fossils stand out because they are "a different color than the rocks" (Russell and Currie, personal communications 1991).

Over three days in the summer of 1992, two American travelers in the Gobi found a *Protoceratops* skull and an entire skeleton. "Only the beak was protruding"; they uncovered enough of the body "to see [that] the entire animal was there . . . in a standing position" (*Bozeman Chronicle* 1992). As Russell and Currie state, "there is every reason to believe that ancient nomads would have seen dinosaur bones" in the territories known to the Issedonians (Mayor and Heaney, in press).

The most common remains are of the 7-to-8-foot (2.1–2.4-m)-long *Protoceratops* (*ceratops* means "horned face") and the smaller "parrot-beaked" Psittacosaurs, both of which combine features of a mammal and a bird of prey (Figs. 9, 10, 11). As noted, the powerfully-beaked and frilled skulls of protoceratopsids are often found attached to complete four-legged skeletons. The protoceratopsid beaks, large nostrils (perhaps mistaken for eyesockets?) and eyesockets, dorsal frills or shields (and the distinctive skulls, knobs, beaks, and giant claws of other species found in these sites) may explain the features of the archaic images of the *gryps,* as well as other unidentified Scythian animals. For *Protoceratops* features see Norman (1985: 48, 49, 53, 61, 122, 127–33, 169).

To ancient observers, the presence of adults, nests, eggs, and young may have suggested scenes of animals defending hatchlings. It is interesting that the habits of the *gryps* as imagined by the ancients anticipated some of the most recent theories about dinosaur behavior: active and agile rather than sluggish and reptilian, nurturing and protection of young (Weishampel, Dodson, and Osmólska 1990: 40–41, 578–99, 616–18).

The fossiliferous sandstone formations are prominent landmarks along the ancient caravan routes, and would have provided shelter and game for travelers and gold-seekers (Mayor and Heaney, in press: notes 34, 35). Ac-

FIG. 9. *Protoceratops* skull. (After Norman 1985.)

cording to Issedonian-Scythian folklore, griffins "guarded" gold; the proximity of the fossil exposures in the badlands and the gold deposits in the gulleys accounts for the ancient association of gold and the *gryps.* Dinosaur remains observed by prospectors may have inspired the notion of monsters "guarding" the approaches to gold, and chance finds of wind-blown gold dust near or actually in "griffin nests" would have reinforced the idea. Knowledge about real birds which collect shiny objects (Pliny 37.54.146, 37.39.149) might have been extrapolated to the *gryps*/griffin, which had a bird's beak and laid eggs in nests. Wings may have been added to enhance the creature's bird-like attributes, to indicate "divine" qualities, or to account for the fossils' odd neck frills.

The Issedonian tale about the fossil remains may have gone something like this hypothesized narration: "To reach the gold, it is a long, difficult journey through a vast, dangerous wilderness surrounded by high mountains. In the foothills and gullies, we sometimes find gold nuggets right on the surface of the sand. As we pass the red rocks of the desert, we see many strange creatures who have all perished. Only skeletons remain—all turned to stone. We find nests with eggs and babies, also turned to stone. Sometimes

FIG. 10. Partially embedded *Protoceratops* skull excavated by Ray Chapman Andrews in Mongolia, 1923. (From Chester A. Reeds, ed., *The New Conquest of Central Asia: A Narrative of the Explorations of the Central Asiatic Expeditions in Mongolia and China 1921–1930.* New York: American Museum of Natural History, 1932.)

we find huge claws as big as drinking cups. These monsters must be fierce and powerful, like lions, with horrible talons, but they are not like any four-legged beast we know. They have strong eagle-like beaks, great staring eyes, and parts like horns or pointed ears. Some seem to have wings or crests. None of us ever hopes to meet a live one!"

The Issedonian folklore about the life and fate of the remarkable animals they came across or heard about near the gold-prospecting areas must have been passed along to neighboring Scythian tribes—reaching the Black Sea Scythians through a series of seven interpreters, according to Herodotus (4.24). Once it reached Greece and Rome, such folklore was almost certainly associated with images of beaked quadrupeds already known from Near Eastern art; popular Scythian representations of griffins reinforced the tale. As trade expanded with Central Asia, the modest set of folk motifs attached to the Asian *gryps*-animal was probably kept vital by contemporary travelers who verified the striking image of the griffin by direct observation of fossils, hearsay, and information about desert gold-mining.

Prehistoric remains of extinct animals are not the universal key to the origins of all legendary creatures, and certainly imagination and symbolism play important roles in the folklore of unknown animals. However, in the case of the classical griffin, it is proposed, based on the substantial evidence

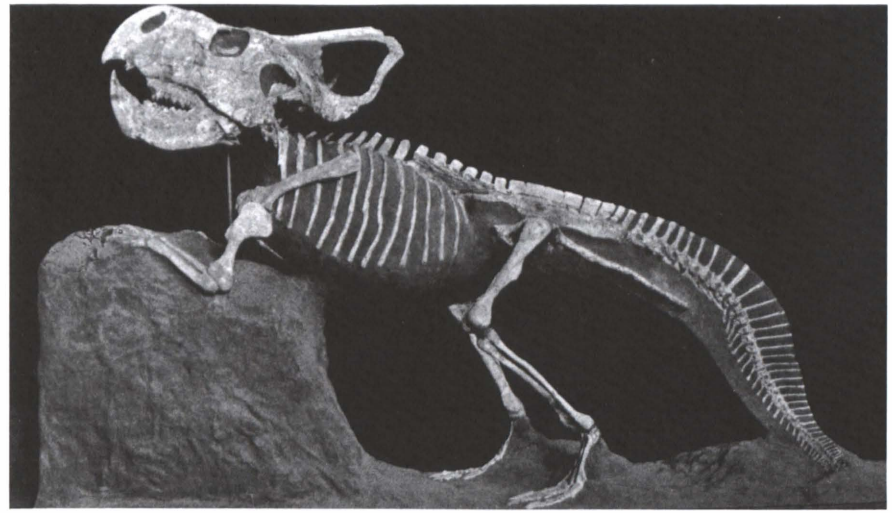

FIG. 11. Skeleton of *Protoceratops andrewsi,* Mongolia. (Source same as Fig. 10.)

reviewed above, that fossils of protoceratopsid dinosaurs were at the heart of the evolution and perpetuation of this ancient cryptid.

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